GEOSS User Needs and System Performance Utility Proposed Functional Specifications

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- Motivation: 10-Year-Implementation Plan Directions
- Functional Specifications
- Architecture
- How to fill the Utility?

Motivation (1)

The five functional components of GEOSS specified in the 10YIP include:

- To address identified common user requirements;
- To monitor performance against defined requirements and intended benefits.

The 10YIP requests:

- to regularly review and assess the needs and requirements for Earth Observation data;
- to involve users in reviewing and assessing requirements for Earth Observation data, products and services;
- to track the performance of observational networks and identify and fix problems.

Motivation (2)

The 10YIP specifies:

"... a distinct and common user requirements database should be established and maintained by GEOSS, building on and linking to existing user requirements databases, such as the CEOS/WMO database of user requirements and observation system capabilities. The database should provide a link between the observation capabilities, data products requirements and societal benefit areas. Furthermore, the database should provide a gap analysis mechanism on the basis of comparison of available observations and data products with the required one."

The 10YIP recommends:

"For updating user requirements, the WMO experience in setting, reviewing, and updating observational data following their process called the Rolling Review of Requirements (RRR) could be used as a model."

CEOS/WMO: Main goal is to support planning of future observing systems; database includes:

- from the "Users": summary of observational requirements of user communities, collected through CEOS
- from the "Providers": summary of the potential performance of the systems;
- instrument and mission descriptions
- programmatic information

Existing Utilities (2)

Online version: http://alto-stratus.wmo.ch/sat/stations/SatSystem.html

Provides tables for:
- observational requirements,
- Space Agencies and Missions,
- Missions and Instruments,
- Instruments,
- Parameters measured by space-based and in-situ instruments,
- Instruments that measure a specific parameter.

Operational requirements for:
WMO, WCRP, GCOS, GOOS, GTOS, IGBP, ICSU, and UNEP.

Requirements in terms of:
- horizontal and vertical resolution (optimal and threshold),
- observation cycle,
- accuracy,
- delay,
- confidence,
- use

Existing Utilities (3)

Example:

User: ICSU

Physical Quantity: Geoid

(only selected columns are shown)

```
            Horizontal KM  Obs Cycle mo. Delay Avail. y      Accuracy (cm)
Requ.    HR    BT     Min   OC    BT  Min  DA      BT     Min  RMS    BT Min Use

Geoid  250   315     500  240 258.5 300   1      1.3     2    2     2.7    5 Geodesy heights
Geoid  250   315     500  240 258.5 300   1      1.3     2    1     1.3    2 Ocean circ.
Geoid  100   215.4 1000    1   2.3  12    0.083 0.151   0.5  0.1   0.311  3 Time variation
```

Critical points:
- Based on concept of 'geophysical parameters'
- No overview of users
- Users are e.g. WMO, WCRP, GCOS, GOOS, GTOS, IGBP, ICSU, UNEP
- No link to SBAs
- No information on applications
- No direct user involvement in RRR

Existing Utilities (5)

(I) NOAA Consolidated Observation Reqs List (CORL):
- mission oriented;
- association to the NASA Global Change Master Directory (Env Parameter (EP), Topic, Term, Variable def. and structure)
- importance "weights" for the major attributes
- structured by NOAA "Goals" - very similar to GEO and USGEO SB area level
- sub-structured by NOAA Goal Programs

(Ia) GEO / USGEO CORL:
- maps NOAA GOALS/Programs to best associated GEO and USGEO SBA
- just started entering, from the available documents

(II) Observing Systems (NASA - NOAA Obs Systems Arch) captures:
- current, planned and potential (concept) systems
- for space-, surface- and subsurface- (land and ocean), air-based systems
- in-site and remote sensing
- associated timeline, status, location, costing, programmatics of each system
- have already identified/noted which of these systems are/will be contributing from NOAA's perspective to GEOSS
- each EP capability linked to its Obs System and specific instrument on the obs system

Existing Utilities (6)

(III) Information Management System (IMS) and their associated EP databases:
- captures specifications of further IMS systems (product processing, distribution, archiving systems etc) and their associated EPs as done for the above Obs Systems and EPs

(IV) Obs Reqs and Capabilities Analysis System (CAS):
- uses the common NASA GCMD "Variable"
- matches each User Obs Req (from CORL) to the comprehensive current, planned and potential Obs and IM System capabilities
- once matched, uses an Obs Reqs Gap Assessment algorithm, including the attribute "weights", to assess the current, planned potential reqs satisfaction level for a given User Obs Req
- process can also be reversed to assess the utility score of one given Obs or IM System to the comprehensive list of User Obs Reqs for a particular EP

Functional Specifications (1)

Some Initial ideas concerning the functions of the User Needs and System Performance Utility (UNSPU) in terms of database contents, analysis functions, and update capabilities.

The UNSPU shall have the following **database components**:
- Users: registry of GEOSS users groups and classes;
- Applications: registry of applications using GEOSS observations and products;
- Quantities: registry of observation quantities and products covered by GEOSS
- Techniques: registry of observation techniques, including observed quantities, accuracy, resolution, latency, reliability, availability, and status (research, operational);
- URs: list of quantitative URs for GEOSS products and observations;
- Performance specifications: list of quantitative specifications of GEOSS performance in terms of observations;
- Systems: registry of GEOSS components and the techniques available to them;
- Observation: registry of observations available to GEOSS;

Functional Specifications (2)

The UNSPU shall provide the following **edit functions for GEO members**:
- registration of users;
- registration of applications;
- registration of quantities;
- registration of techniques.

The UNSPU shall provide for **authorized administrators edit functions** for the following components:
- URs
- Performance specifications;
- Systems;
- Observations.

Functional Specifications (3)

The UNSPU shall provide for the following **links**:
- the linkage of users to applications;
- the linkage of applications to GEOSS products;
- the linkage of GEOSS products to observation quantities
- the linkage of performance specifications to available observations and products;

The UNSPU shall provide the following **analysis functions**:
- identification of deviations of system performance from specifications;
- identification of applications not receiving the required observations and products (gaps analysis);
- identification of users not able to utilize the full benefit of Earth observations.

Architecture

Earth system
- Quantities

User Requirements:
- Users
- Applications
- Requirements
- User <-->Applications
- Applications <--> Requirements

System Performance:
- Techniques
- Observations
- Products

Links:
- Observations, Products, and Requirements are linked through Quantities

Filling the Database

GEO approach to fill the tables:

- Demand versus offer-based?
- Provider-based (e.g., IGOS Themes): Looking from GEOSS to the user needs in the SBAs.
- Science-based: Considering the need for comprehensive monitoring, the spatial and temporal characteristics of the quantities determine the necessary monitoring system.
- User-based: GEO User Interface Committee and Communities of Practice provide the user needs.